Bayou Chene (Subsegment 050603), Louisiana, Draft TMDL for Dissolved Lead

Prepared for:

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Total Maximum Daily Load Program

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EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* Part 130) require states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily loads (TMDLs) of pollutants for those waterbodies. A TMDL establishes the amount of a pollutant that a waterbody can assimilate without exceeding its water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources in order to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

This dissolved lead TMDL has been developed for Bayou Chene, in the Mermentau River Basin in southwestern Louisiana. Bayou Chene flows for 33 miles from the headwaters to Lacassine Bayou and includes Bayou Grand Marais.

For the purpose of TMDL development, the dissolved lead numerical criterion was calculated using the freshwater chronic value for aquatic life protection calculated on the basis of the average hardness values from 2007 at Station 658 (Bayou Chene south of Welsh, Louisiana). The dissolved lead numerical criterion for Bayou Chene was determined to be 1.03 micrograms per liter. For the purpose of this TMDL, dissolved lead was considered to be a conservative parameter. Using the 7Q10 flow at the end of subsegment 050603 and the calculated lead criterion, a TMDL of 0.0779 pound per day was calculated. The TMDL was then allocated to its WLA, MOS, and LA components.

1. Introduction

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (Title 40 of the *Code of Federal Regulations* [CFR] Part 130) require states to develop total maximum daily loads (TMDLs) of pollutants for waterbodies that are not supporting their designated uses, even if pollutant sources have implemented technology-based controls. A TMDL establishes the maximum allowable load (mass per unit of time) of a pollutant that a waterbody is able to assimilate and still support its designated uses. The maximum allowable load is determined on the basis of the relationship between pollutant sources and in-stream water quality. A TMDL provides the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

This dissolved lead TMDL has been developed for Bayou Chene, in the Mermentau River Basin in southwestern Louisiana. Bayou Chene flows for 33 miles from the headwaters to Lacassine Bayou and includes Bayou Grand Marais (Figure 1-1).

LDEQ placed Bayou Chene on the state's 303(d) list in 2000 and identified it as not supporting its designated use of fish and wildlife propagation because of organic enrichment/low dissolved oxygen, mercury, and metals (cadmium, copper, and lead). The suspected sources of the impairment were agriculture, hydromodification, and unknown sources (LDEQ 2001). LDEQ included Lacassine Bayou on the state's 303(d) list in 2002 and identified it as not supporting its designated use of fish and wildlife propagation because of low dissolved oxygen (LDEQ 2003). LDEQ included Lacassine Bayou on the 2004, 2006, and draft 2008 editions of the state's *Louisiana Water Quality Inventory: Integrated Report* (*Integrated Report*) and identified it as not supporting its designated use of fish and wildlife propagation because of low dissolved oxygen from irrigated and non-irrigated crop production, and from Fipronil for irrigated crop production (LDEQ 2005, 2007a, 2008). Also on the state's 2006 and draft 2008 *Integrated Reports* is an impairment of the designated use of fish and wildlife propagation because of mercury from atmospheric deposition—toxics and unknown sources (LDEQ 2007a). The state's draft 2008 *Integrated Report* also includes and impairment to the fish and wildlife propagation designated use because of lead. The suspected source of impairment from lead is unknown (LDEQ 2008).

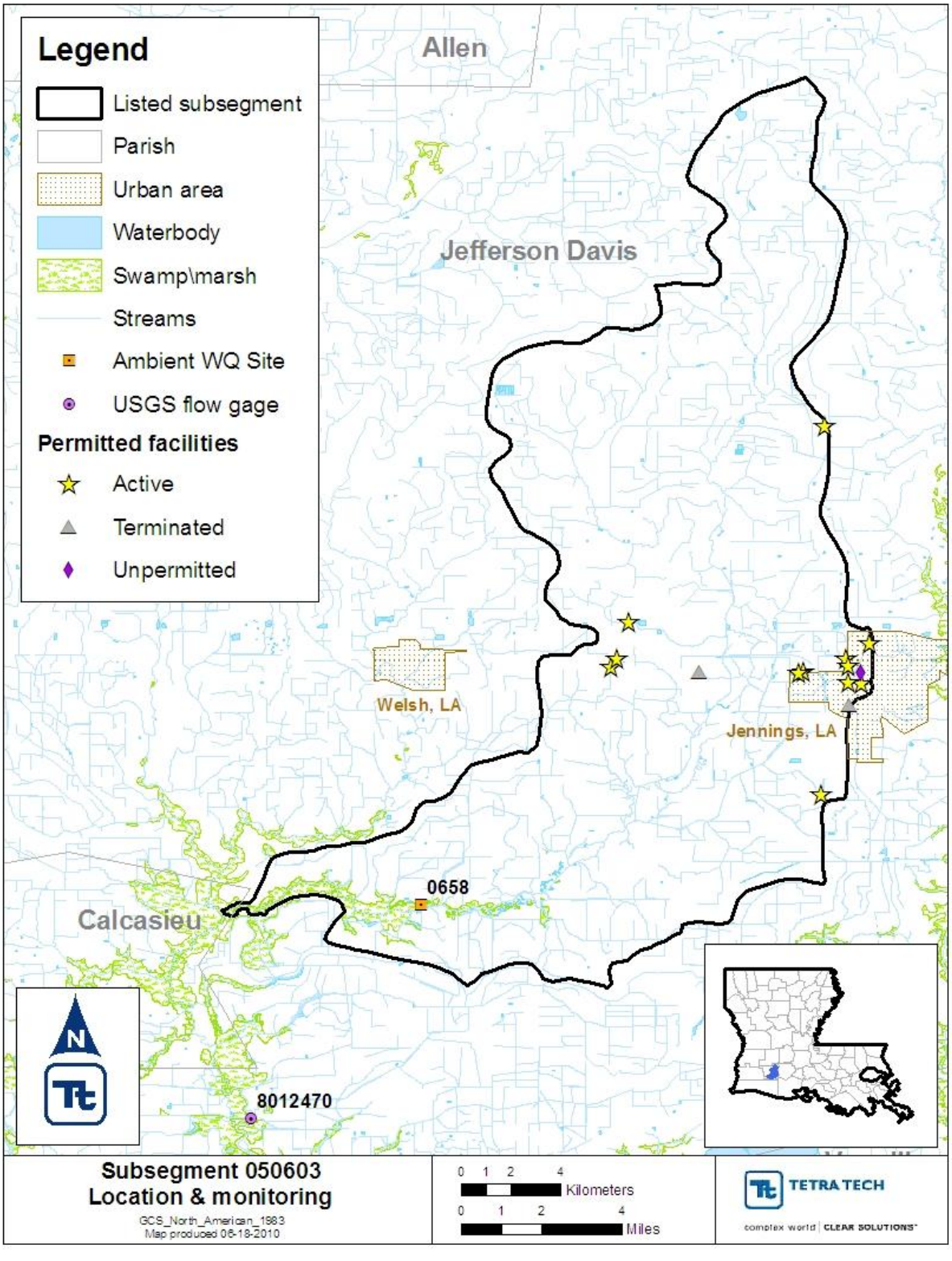

Figure 1-1. Subsegment 050603 (Bayou Chene) location and monitoring.

2. Study Area Description

2.1 Mermentau River Basin—Bayou Chene

This dissolved lead TMDL has been developed for Bayou Chene, in the Mermentau River Basin in southwestern Louisiana. Bayou Chene flows for 33 miles from the headwaters to Lacassine Bayou and includes Bayou Grand Marais (Figure 1-1). The Bayou Lacassine watershed is 398 square miles and is in the southwestern portion of the Mermentau River Basin. Bayou Lacassine includes two subsegments, 050601 and 050603. Subsegment 050603 includes Bayou Chene from its headwaters to Lacassine Bayou along with Bayou Grand Marais (LDEQ 2009a).

The region is sparsely populated and characterized mainly by agriculture. The two main urban communities are Welsh and Jennings. The Bayou Lacassine watershed has the following tributaries: East and West Bayou Lacassine, Bayou Chene, Thornwell Drainage Canal and several unnamed tributaries. The area is sparsely populated outside those small rural communities. The Welsh and Jennings wastewater treatment systems are the only two included in the modeling effort for the TMDL (LDEQ 2009a).

The main agricultural crops in the watershed are rice, soybeans, pasture, and sugarcane. A seasonal peak occurs in the concentration of nutrients in the bayous (nitrates and nitrites, total Kjeldahl nitrogen, and total phosphorous) and coincides with the spring discharge of muddy water from the rice fields. That association is supported by more than two decades of water quality data collected by LDEQ. Cumulative evidence exists that a large proportion of the loading in the watershed is exerted in a concentrated region in the upper mainstem of Bayou Lacassine and around the confluence of East and West Bayou Lacassine. That area is dominated by rotational rice/soybean production. Implementing best management practices, such as precision leveling and dry field planting should eliminate the spring rice discharges and bring the watershed into compliance with the TMDLs for dissolved oxygen. Bayou Lacassine has had exceedances of the pesticides Carbofuran and Fipronil. The use of Carbofuran is now strictly limited (LDEQ 2009a).

Land use data from the 2001 National Land Cover Database (NLCD) were used as shown in Table 2-1 and Figure 2-1. NLCD 2001 is a land-cover database composed of land cover, impervious surface, and canopy density data. NLCD 2001 uses improved classification algorithms, which result in data with more precise rendering of spatial boundaries between the 16 classes than those obtained using NLCD 1992 (USEPA 2007).

Table 2-1. Subsegment 050603 land use (NLCD 2001)

Land use	Percent
Open water	0.05%
Developed	8.66%
Barren land	0.02%
Forest	0.09%
Grass/shrub	2.32%
Pasture/hay	9.59%
Cultivated crops	74.64%
Woody wetlands	4.19%
Emergent herbaceous wetlands	0.44%

Source: USEPA 2007

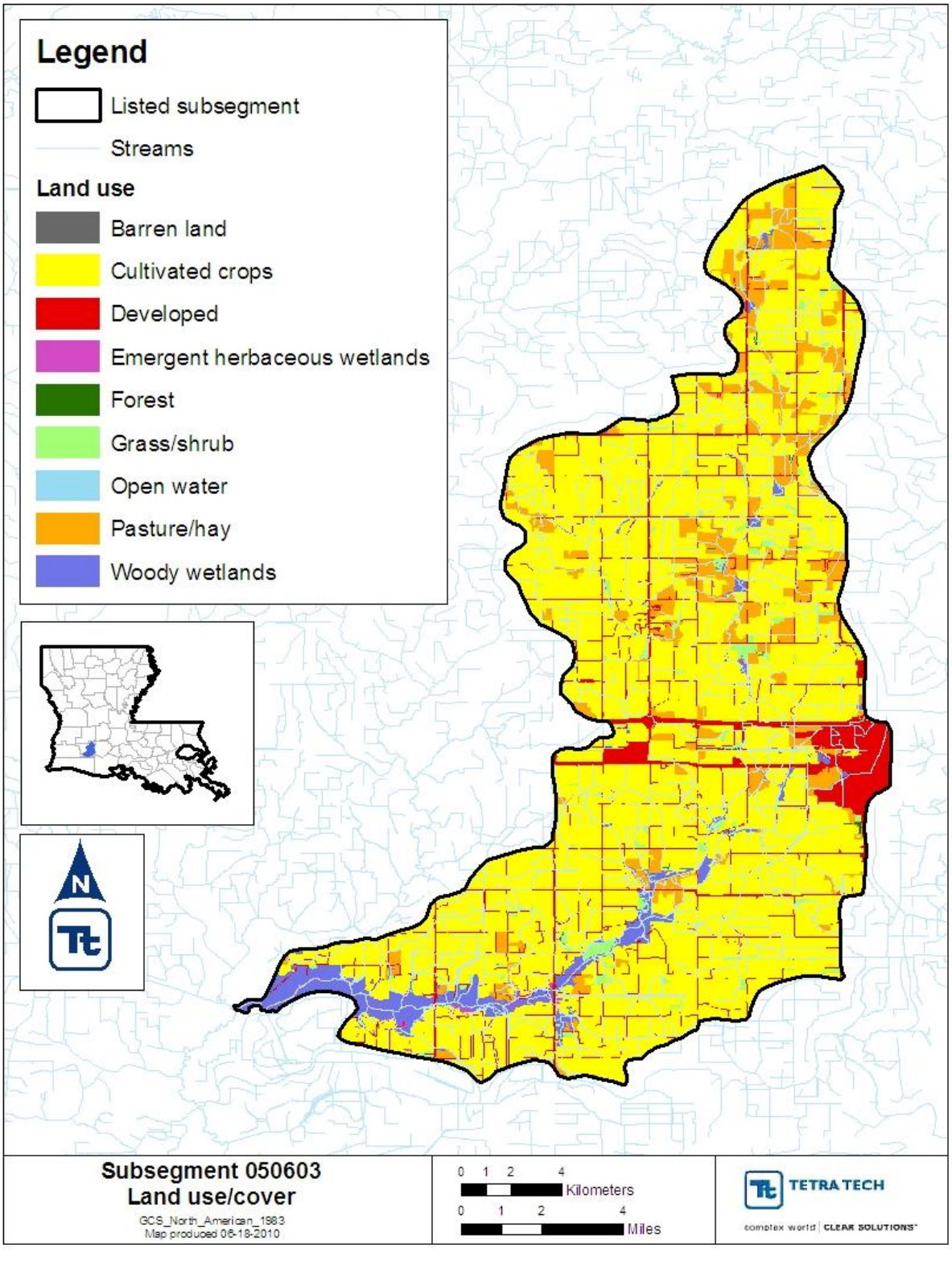

Figure 2-1. Land use in subsegment 050603 (Bayou Chene).

2.2 Water Quality Data

One water quality station is on Bayou Chene with lead data collected since 2005. Station 658 (Bayou Chene south of Welsh, Louisiana) has four dissolved lead observations collected since 2005. Appendix A contains the raw water quality data. The lead data from station 658 containing recent data were plotted over time for subsegment 050603 (Figure 2-2). No distinct seasonal trends or patterns can be seen in the water quality data.

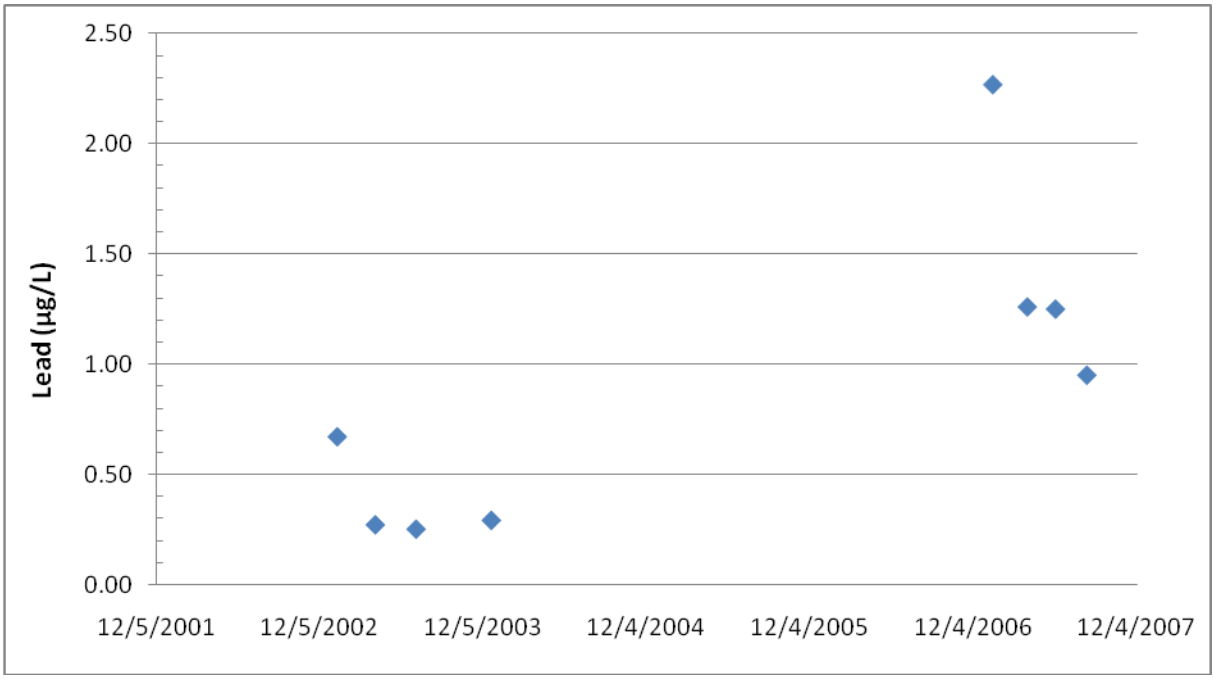

Figure 2-2. Dissolved lead data at station 658.

2.3 Water Quality Standards and Criteria

The designated uses for subsegment 050603 are primary and secondary contact recreation, propagation of fish and wildlife, and agriculture. Primary contact recreation consists of any recreational or other water contact activity involving prolonged or regular full-body contact with the water and in which the probability of ingesting appreciable amounts of water is considerable. Examples of that type of water use are swimming, water skiing, and diving (LDEQ 2007b). Secondary contact recreation consists of any recreational or other water contact activity in which prolonged or regular full-body contact with the water is either incidental or accidental, and the probability of ingesting appreciable amounts of water is minimal. Examples of that type of water use are fishing, wading, and boating (LDEQ 2007b). The criteria for protection of aquatic life are based on acute and chronic concentrations in fresh and marine waters and are developed primarily for attainment of the fish and wildlife propagation use.

The aquatic life criterion was used for this TMDL along with the 7Q10 flow for the waterbody. Metals criteria are based on hardness concentrations in ambient waters. The criterion was calculated from the freshwater chronic criteria equation (LDEQ 2009b):

$$\text{Criterion} = e^{((1.2730 \times (ln(\text{hardness}))) - 4.7050)} \times (1.46203 - (0.145712 \times ln(\text{hardness})))$$

Hardness concentrations from the past 5 years at station 658 were averaged and used in calculating the lead criteria. The average hardness concentration for the subsegment 050603 is 44.5 milligrams

per liter (mg/L). The applicable chronic lead criterion, therefore, is 1.03 µg/L. The criterion applies at all times. The available dissolved lead data and the sample exceedances are shown in Appendix A.

The Louisiana water quality standards also include an antidegradation policy (*Louisiana Administrative Code* Title 33, Part IX, Section 1109.A), which states that state waters exhibiting high water quality should be maintained at that high level of water quality. If that is not possible, water quality of a level that supports the designated uses of the waterbody should be maintained. The designated uses of a waterbody may be changed to allow a lower level of water quality only through a use attainability study. LDEQ has developed this TMDL to be consistent with the state's antidegradation policy (LDEQ 2000).

2.4 Flow

U.S. Geological Survey (USGS) flow monitoring gage, 08012470 (Bayou Lacassine near Lake Arthur, Louisiana), is in a nearby watershed. The flows at the USGS gage flow in both directions because of such factors as wind, tides, and irrigation pumping. The critical low flow (7Q10) is 40 cubic feet per second (cfs) for the gage. The 7Q10 was calculated using the lowest positive 7-day average flow for each climatic year.

2.5 Identification of Sources

Louisiana's draft 2008 *Integrated Report* lists Bayou Chene as not supporting its designated use of fish and wildlife propagation because of lead from unknown sources (LDEQ 2008). LDEQ has established a group of reference streams throughout the state that exhibit near-pristine characteristics and have no man-made sources discharging or contributing runoff into them. Two of the reference streams in the Calcasieu Basin—Six Mile Creek and Beckwith Creek—were found as not supporting the lead criteria during the 2000 305(b) assessment. Therefore, LDEQ concluded that natural background loading is the dominant source of lead in other waterbodies in the state (LDEQ 2004).

Information on point source dischargers in the subsegment was obtained from LDEQ files. According to the LDEQ discharger database, 13 point sources are currently discharging into subsegment 050603 and two permits were terminated in 2005 (Figure 2-3 and Table 2-2).

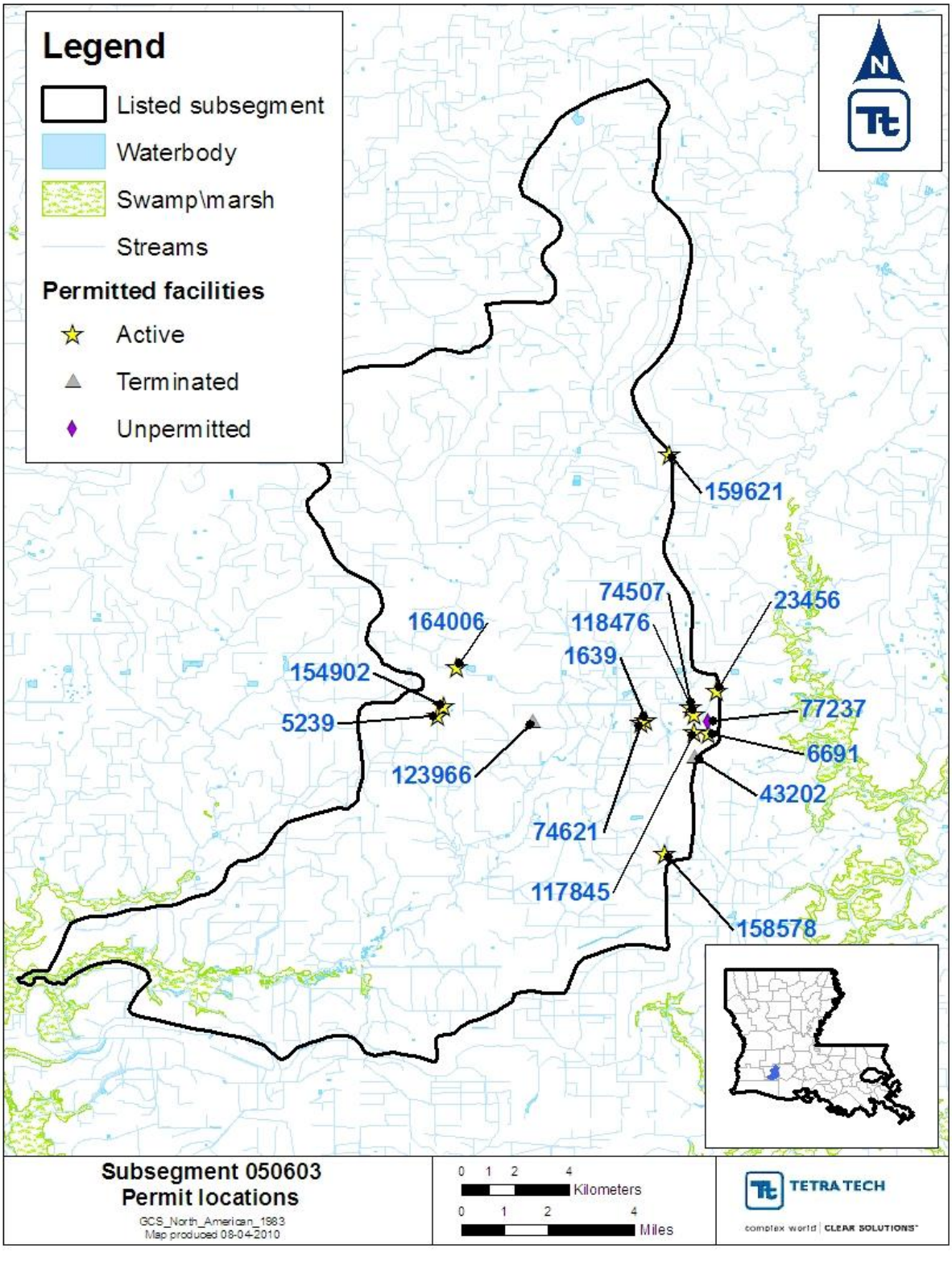

Figure 2-3. Permit locations in subsegment 050603 (Bayou Chene).

Table 2-2. Summary of LPDES permits in subsegment 050603

AI #	Permit #	Outfall	Facility name	Exp. date	Facility type	Outfall type	Receiving waterbody
159621	LA0124290	001	Jefferson Davis Parish Police Jury - Jefferson Davis Parish Water District #4	6/9/2014	Nonclassifiable Establishments	backwash and wastewater	pipe – Bryan Road ditch – Hwy 26 ditch – unnamed ditch - West Bayou Grand Marais
		002				treated sanitary wastewater	pipe – Bryan Road ditch – Hwy 26 ditch – unnamed ditch - West Bayou Grand Marais
1639	LAG110196	001	Angelle Concrete Group LLC - Jennings Plant	3/15/2014	Stone, Clay, Glass, and Concrete Products	stormwater and wastewater	ditch to East Bayou Grand Marais
6691	LAG470021	001	Bubba Oustalet Chevrolet-Cadillac Inc	9/1/2014	Auto dealers and gasoline service stations	washrack wastewater	local drainage – Bayou Grand Marais
		002				floor washwater	local drainage – Bayou Grand Marais
		003				washdown and wastewater	local drainage - Bayou Grand Marais
154902	LAG532539	001	US Postal Service - Roanoke Post Office	11/8/2012	Federal Agency	treated sanitary wastewater	ditch – West Grand Marais Ditch - Bayou Chene
5239	LAG540399	001	Welsh Roanoke Jr High School	7/17/2013	Educational Services	treated sanitary wastewater	local drainage – Bayou Chene
118476	LAG750472	001	Bungalow Bill's Super Clean	3/15/2014	Automotive Repair, Services, and Parking	wash wastewater	East Bayou Grand Marais – Bayou Chene
164006	LAG541731	001	Petos I-10 - Petos I-10 LLC	6/30/2013	General Agency Interest	treated sanitary wastewater	local drainage to West Grand Marais Ditch to Bayou Chene
74507	LAG750534	001	Diamond Shamrock #619	3/15/2014	Food and Kindred Products	wash wastewater	ditch – Bayou Grand Marais
117845	LAG750553	001	Russell Dupuis Carwash	3/15/2014	Automotive Repair, Services, and Parking	wash wastewater	drainage ditch – Bayou Lacassine
74621	LAR05N309		LADOTD - Jennings Maintenance Unit	5/1/2011	State Agency	MSGP - stormwater	Bayou Chene
23456	LAR05N465		T-3 Energy Services	5/1/2011	Fab. Metal Prod., Exc. Mach. and Trans. Equip.	MSGP - stormwater	East Bayou Grand Marais Canal
158578	LAR05N992		South Jennings Commercial SWD Facility - Charles Holston Inc	7/1/2013	Nonclassifiable Establishments	MSGP - stormwater	ditch – Bayou Grand Marais
77237	LAU004095		Buddy's Chevron	n/a	Auto dealers and gasoline service stations	vehicle wastewater	
43202	LAR05M580		Sentry Building Components	Terminated 4/12/05	General Agency Interest		
123966	LAR10C622		Grand Prairie Estates Subdivision - Construction	Terminated 9/25/05	Nonclassifiable Establishments		

n/a = not applicable (facility is not permitted)

3. TMDL Load Calculations

A TMDL is the total amount of a pollutant that can be assimilated by the receiving waterbody while still achieving water quality standards. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis for establishing water quality-based controls.

A TMDL for a given pollutant and waterbody is composed of the sum of individual WLAs for point sources, LAs for nonpoint sources and natural background levels. In addition, the TMDL must

include an implicit or explicit MOS to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The TMDL components are illustrated in the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS.$$

TMDLs are typically expressed as a mass loading (e.g., pounds per day [lbs/day]).

Both section 303(d) of the Clean Water Act and the regulations at 40 CFR 130.7 require that TMDLs include an MOS to account for uncertainty in available data or in the actual effect that controls will have on the loading reductions and receiving water quality. The MOS may be expressed explicitly as unallocated assimilative capacity or implicitly using conservative assumptions in establishing the TMDL. For a more detailed discussion of the MOS, see Section 3.4.

3.1 Load Determination for Bayou Chene (050603)

The sampling events used as the basis for this TMDL were performed to meet the needs of the state to develop the *Integrated Report*, which includes the biennial section 305(b) report (*Water Quality Inventory*) and the section 303(d) list of impaired waters. The data are adequate for a conservative TMDL according to the assumption that no fate and transport mechanisms are present in the waterbodies. Data gathering did not include any flow measurements, any hardness measurements, nor any upstream sampling and measurements for background conditions. Without such data, fate and transport modeling and calculating reductions required from current loads are not possible.

Calculating the TMDL

Dissolved lead was treated as a conservative parameter. The following equation was used to calculate the dissolved lead TMDL, and the TMDL calculations are shown further below.

$$TMDL \text{ (lb/day)} = (\textit{lead criterion} \text{ [mg/L]}) \times (\textit{critical flow} \text{ [mgd]}) \times 8.345$$

where 8.345 is a conversion factor. Only observed data from during 2005 and after were used in this TMDL. The critical (7Q10) flow from USGS gage 08012470 was used to develop this TMDL and is described in Section 2.4 and was adjusting on the basis of drainage area to a critical flow of 17.9 cfs. The drainage area of the USGS gage is 299 square miles, and the area of the subsegment is 134 square miles.

Lead criterion = 1.03 µg/L = 0.00103 mg/L

Critical flow (7Q10) = 17.9 cfs = 11.6 mgd

TMDL = (0.00103 mg/L) × (11.6 mgd) × 8.345 = 0.0997 lb/day

3.2 Wasteload Allocation (WLA)

The WLA portion of the TMDL equation is the total loading of a pollutant that is assigned to point sources. Stormwater loading is usually based on average annual rainfall, while the TMDL is calculated at critical low (7Q10) flow. Since these two conditions are not compatible, LDEQ assumes that stormwater runoff is zero when developing a TMDL at critical low flow. All of the individual point source facilities identified in Section 2.5 are permitted to discharge to subsegment 050603. For this TMDL, which is being developed at 7Q10 flow, facility stormwater flows should be assumed to be zero.

WLAs were calculated at each outfall for all permitted point sources in subsegment 050603 (Table 3-1). The equation for WLA calculation is

$$WLA \text{ (lbs/day)} = (limit \text{ [mg/L]}) \times (flow \text{ [gpd]}) \times 0.000008345$$

where 0.000008345 is a conversion factor. The WLA is 0.0 lb/day.

Table 3-1. WLA summary for subsegment 050603 for total lead

AI #	Permit #	Outfall	Facility name	Outfall type	Flow type	Flow (gpd)	Lead limit type	Total lead limit (µg/L)	Total lead load (lb/d)
159621	LA0124290	001	Jefferson Davis Parish Police Jury - Jefferson Davis Parish Water District #4	backwash and wastewater	expected	38,300	none		0
		002		treated sanitary wastewater	expected	40	none		0
1639	LAG110196	001	Angelle Concrete Group LLC - Jennings Plant	stormwater and wastewater	DMR average	0	none		0[a]
6691	LAG470021	001	Bubba Oustalet Chevrolet-Cadillac Inc	washrack wastewater	DMR average	2,350	none		0
		002		floor washwater	not avail.		none		0
		003		washdown and wastewater	not avail.		none		0
154902	LAG532539	001	US Postal Service - Roanoke Post Office	treated sanitary wastewater	expected	40	none		0
5239	LAG540399	001	Welsh Roanoke Jr High School	treated sanitary wastewater	DMR 30-day max	3,300	none		0
164006	LAG541731	001	Petos I-10 - Petos I-10 LLC	treated sanitary wastewater	expected	10,080	none		0
118476	LAG750472	001	Bungalow Bill's Super Clean	wash wastewater	DMR average	2,500	none		0
74507	LAG750534	001	Diamond Shamrock #619	wash wastewater	not avail.		none		0
117845	LAG750553	001	Russell Dupuis Carwash	wash wastewater	not avail.		none		0
74621	LAR05N309		LADOTD - Jennings Maintenance Unit	MSGP - stormwater	not avail.		none		0[a]
23456	LAR05N465		T-3 Energy Services	MSGP - stormwater	DMR average	0	none		0[a]
158578	LAR05N992		South Jennings Commercial SWD Facility - Charles Holston Inc	MSGP - stormwater	not avail.		none		0[a]
77237	LAU004095		Buddy's Chevron	vehicle wastewater	not avail.		n/a		0

n/a = not applicable (facility is not permitted)

[a] This TMDL is being developed for critical low-flow conditions (7Q10). Under low-flow conditions, the WLA for all stormwater discharges will be 0.0 lb/d because the flow will be 0.0 mgd. However, existing stormwater permits limits continue to apply to all stormwater discharges.

LPDES permitted discharges without lead effluent limitations have been determined to not be sources of lead. For these dischargers, LDEQ is not providing allocations or permit limits. If at some point in the future, LDEQ determines that any of the discharges may contain lead, wasteload allocations may be provided along with the appropriate permit conditions.

3.3 Seasonal Variability

Because ambient monitoring data indicate that there is little variability of trace metals levels throughout the year, LDEQ has not defined a critical season.

3.4 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration an MOS. The MOS is the portion of the pollutant loading reserved to account for any uncertainty in the data. There are two ways to incorporate the MOS. One is to implicitly incorporate it by using conservative model assumptions to develop allocations. The other is to explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations (USEPA 1991). For this TMDL, an explicit MOS of 20 percent was used. The MOS is 0.0798 lb/day.

3.5 Load Allocation (LA)

The LA is the portion of the TMDL assigned to natural background loadings, nonpoint sources, urban runoff, and other anthropogenic sources. The LA was calculated for this TMDL by subtracting the WLA and MOS from the total TMDL. LAs were not allocated to separate nonpoint sources because of the lack of available source characterization data. The LA includes natural background sources. LDEQ recognizes that stormwater may contribute to the lead impairments for subsegment 050603, however, LDEQ cannot provide an allocation for stormwater with a TMDL developed for critical, low-flow conditions.

$$\sum LAs = TMDL - \sum WLAs - \text{MOS}$$

$$\sum \text{LAs} = 0.0997 - 0 - 0.0798$$

$$\sum \text{LAs} = 0.0199 \text{ lb/day}$$

4. Monitoring Plan

LDEQ uses funds provided under section 106 of the Clean Water Act and under the authority of the Louisiana Environmental Quality Act to run a program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations using appropriate sampling methods and procedures to ensure the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, develop a long-term database for water quality trend analysis, and monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the state's biennial *Water Quality Inventory* and the section 303(d) list of impaired waters. The information is also used to establish priorities for LDEQ's nonpoint source program.

LDEQ has implemented a watershed approach to surface water quality monitoring. Through that approach, the entire state is sampled on a 4-year cycle. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 4-year cycle. Sampling is conducted monthly to yield approximately 12 samples per site during each year the site is monitored. Sampling sites are where they are considered representative of the waterbody. Within each basin, all monitored subsegments will be sampled over the year or years specified under each cycle period. Bayou Chene was monitored with the Mermentau River Basin in 2006, 2007, 2008, and 2009. Water quality assessments for the 305(b)/303(d) *Integrated Report* will be conducted for each basin following the last year of its monitoring period. Usually 125 waterbody subsegments are monitored each month under the program. Under the current monitoring schedule, approximately one-half of the state's waters are newly assessed for section 305(b) and section 303(d) listing purposes for each biennial cycle, with sampling occurring statewide each year. The 4-year cycle follows an initial 5-year rotation that covered all basins in the state according to the TMDL priorities.

Monitoring allows LDEQ to determine whether any improvement has occurred in water quality after the TMDLs have been implemented. When LDEQ evaluates monitoring results at the end of each year, it may add waterbodies to or remove them from the section 303(d) list of impaired waterbodies.

5. Public Participation

Federal regulations require LDEQ to notify the public and seek comments concerning the TMDLs it prepares. This TMDL was developed under contract to LDEQ, and LDEQ will hold a public review period seeking comments, information, and data from the public and any other interested party. The notice for the public review period will be published in local and state newspapers and on LDEQ's electronic notification system. The TMDL report will be available on LDEQ's TMDL Web site at www.deq.louisiana.gov/portal/default.aspx?tabid=1563. The public review period will last for 30 days. LDEQ will review all comments received, and this TMDL might be revised to reflect comments if appropriate.

6. References

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Appendix A. Hardness and Lead Monitoring Data

Table A-1. Hardness data for station 658

Site	Collection date[a]	Result (mg/L)
Bayou Chene south of Welsh, Louisiana	10/7/1998	41.3
Bayou Chene south of Welsh, Louisiana	10/21/1998	45
Bayou Chene south of Welsh, Louisiana	11/5/1998	44.7
Bayou Chene south of Welsh, Louisiana	11/18/1998	34.2
Bayou Chene south of Welsh, Louisiana	12/2/1998	40.2
Bayou Chene south of Welsh, Louisiana	1/13/2003	31.6
Bayou Chene south of Welsh, Louisiana	2/4/2003	62.1
Bayou Chene south of Welsh, Louisiana	3/11/2003	39.9
Bayou Chene south of Welsh, Louisiana	4/8/2003	106
Bayou Chene south of Welsh, Louisiana	5/6/2003	82.3
Bayou Chene south of Welsh, Louisiana	6/3/2003	51.6
Bayou Chene south of Welsh, Louisiana	7/8/2003	59.6
Bayou Chene south of Welsh, Louisiana	8/19/2003	53
Bayou Chene south of Welsh, Louisiana	9/9/2003	61.7
Bayou Chene south of Welsh, Louisiana	10/7/2003	63.4
Bayou Chene south of Welsh, Louisiana	11/5/2003	45.3
Bayou Chene south of Welsh, Louisiana	12/2/2003	34.7
Bayou Chene south of Welsh, Louisiana	1/16/2007	46
Bayou Chene south of Welsh, Louisiana	2/14/2007	34.2
Bayou Chene south of Welsh, Louisiana	3/13/2007	41
Bayou Chene south of Welsh, Louisiana	4/3/2007	44.1
Bayou Chene south of Welsh, Louisiana	4/24/2007	84.9
Bayou Chene south of Welsh, Louisiana	5/15/2007	57.8
Bayou Chene south of Welsh, Louisiana	6/5/2007	38.8
Bayou Chene south of Welsh, Louisiana	6/26/2007	5.2
Bayou Chene south of Welsh, Louisiana	7/24/2007	46.8
Bayou Chene south of Welsh, Louisiana	8/14/2007	44.9
Bayou Chene south of Welsh, Louisiana	9/12/2007	42
Bayou Chene south of Welsh, Louisiana	10/3/2007	48.3

a. Data from before 2005 were not included in TMDL analysis.

Table A-2. Hardness summary statistics

Statistic	Value
Minimum (mg/L)	5.2
Maximum (mg/L)	84.9
Average (mg/L)	44.5
Count	12

a. Data from before 2005 were not included in TMDL analysis.

Table A-3. Dissolved lead data for station 658

Site	Collection date	MDL (µg/L)	Type	Result (µg/L)[a]
Bayou Chene south of Welsh, Louisiana	6/17/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	8/19/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	8/26/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	9/16/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	10/21/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	11/18/1998		Filtered	**5**
Bayou Chene south of Welsh, Louisiana	1/13/2003	0.01	Filtered	0.67
Bayou Chene south of Welsh, Louisiana	4/8/2003	0.01	Filtered	0.27
Bayou Chene south of Welsh, Louisiana	7/8/2003	0.01	Filtered	0.25
Bayou Chene south of Welsh, Louisiana	12/23/2003	0.01	Filtered	0.29
Bayou Chene south of Welsh, Louisiana	1/16/2007	0.2	Filtered	**2.27**
Bayou Chene south of Welsh, Louisiana	4/3/2007	0.04	Filtered	**1.26**
Bayou Chene south of Welsh, Louisiana	6/5/2007		Filtered	**1.25**
Bayou Chene south of Welsh, Louisiana	8/14/2007		Filtered	0.95

a. Exceedances of the calculated standard are bold. Data from before 2005 were not included in TMDL analysis.

Table A-4. Dissolved lead summary statistics

Statistic	Value[a]
Minimum (µg/L)	0.95
Maximum (µg/L)	2.27
Average (µg/L)	1.43
Count	4
Percentage of data that violate the standard	67

a. Data from before 2005 were not included in TMDL analysis.